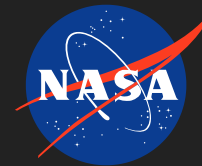


Development of an Objective Behavioral Assay of Cohesion to Enhance Composition, Task Performance, and Psychosocial Adaptation in Long-Term Work Groups

Completed Technology Project (2012 - 2016)



Project Introduction

The long-term goal of the proposed research is to deliver a software tool (currently referred to by its working title of "Team Performance Task" [TPT]) that will allow long-duration exploration crews to autonomously derive objective, standardized, and quantifiable measures on social dynamics while serving as a decision-aid tool in astronaut selection and multinational crew composition. This approach is unique because it is simple, rapid, and operationally feasible like a questionnaire, but is entirely objective, is innovative in that it requires a group-level demonstration of social dynamics rather than relying on individual opinions, and is language-independent, thus making it suitable for cross-cultural applications. Such an empirically validated and operationally feasible software deliverable will contribute to an overall risk mitigation strategy comprised of quantitative, qualitative, objective, and subjective assessment technologies. To accomplish this, we have been conducting ground-based experiments to systematically investigate the effects of group composition (gender and personality) on voluntary cooperative propensity in 3-person teams. We are also assessing the predictive validity of pre-mission TPT "social personality profiles" and the effects of group composition on performance, task cohesion, social cohesion, and biopsychosocial adaptation in mixed-gender "crews" participating in a long-term simulated space exploration task. We are also developing next-generation software to advance the technology beyond our current prototype used for proof-of-concept/validation research into a broadly applicable tool with cross-platform networking and connectivity, enhanced usability/human factors features, extensive parameter manipulation/flexibility to maximize sensitivity, and integrated data collection and processing capabilities. The proposed project will elucidate the influences of personality, gender, behavior, and neurobiology at the individual and group levels while yielding powerful experimental insights on the relationships between group composition, mission performance, task cohesion, social cohesion, and psychosocial adaptation in long-term work groups. The work will provide a scientifically validated TPT concept translated into a flexible and operationally acceptable software tool suitable for field studies of predictive validity and/or countermeasure potential in mission-oriented analog populations and/or high-risk operational and long-duration space analog environments. This work will contribute to the empirical knowledge base used to inform the processes of crew selection, composition, training, monitoring, and maintenance, and will ultimately yield a broadly applicable software tool to help mitigate risks and maximize behavioral health and performance for long-duration space exploration.

Anticipated Benefits

The project will elucidate the interacting influences of personality, gender, and behavior at the individual and group levels while yielding powerful experimental insights on the relationships between group composition, task



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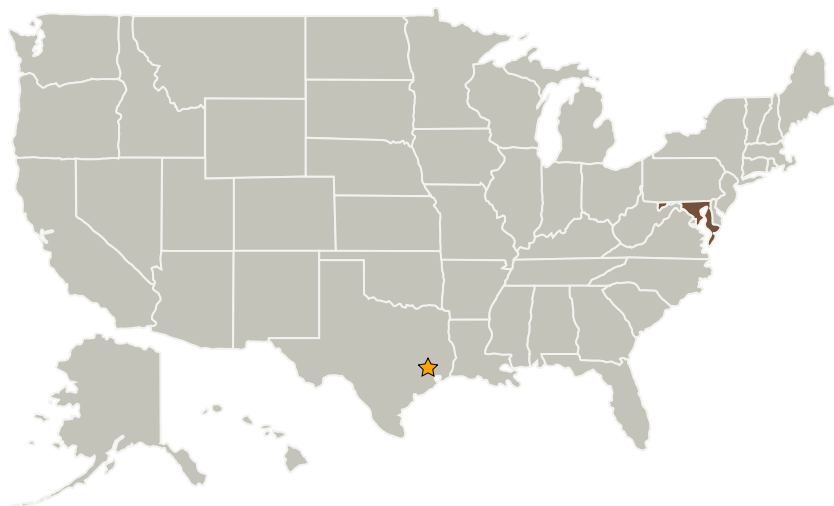
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cohesion, social cohesion, and biopsychosocial adaptation in long-term work groups. The broad knowledge-base and software tools derived from this work are relevant to social relationships, business, and education, as well as military, healthcare, commercial transportation, and other settings involving high-risk/high-performance teamwork and the need for scientifically based objective assessment methods.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations

Maryland

Project Transitions



October 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Operations Mission Directorate (SOMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Human Spaceflight Capabilities

Project Management

Program Director:

David K Baumann

Project Manager:

Lauren B Leveton

Principal Investigator:

Peter Roma

Co-Investigator:

Steven Hursh

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October 2016: Closed out

Closeout Summary: We completed data collection for the Short-Term study (N =252 in 84 teams). We completed data collection for the Long-Term study (N=96 in 32 teams over 12 sessions). We completed data collection for space analog missions at NASA Extreme Environment Mission Operations (NEEMO) (one 7-day mission), Human Exploration Research Analog (HERA) (four 7-day and four 14-day missions), Hawai'i Space Exploration Analog and Simulation (HI-SEAS) (4-, 8-, and 12-month missions), and Concordia Station (three winters). We completed development of a software product called COHESION (Capturing Objective Human Econometric Social Interactions in Organizations and Networks), a simple, rapid, and objective behavioral assay of cooperation, productivity, and fairness in small groups.

Stories

Abstracts for Journals and Proceedings
(<https://techport.nasa.gov/file/37844>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37849>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37847>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37851>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37846>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37848>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37850>)

Articles in Peer-reviewed Journals
(<https://techport.nasa.gov/file/37845>)

Books/Book Chapters
(<https://techport.nasa.gov/file/37852>)

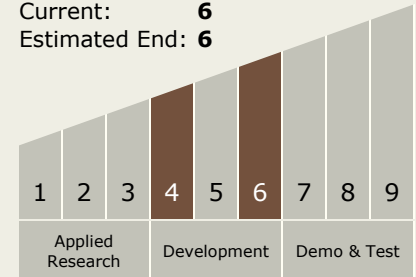
Books/Book Chapters
(<https://techport.nasa.gov/file/37853>)

Papers from Meeting Proceedings
(<https://techport.nasa.gov/file/37854>)

Significant Media Coverage
(<https://techport.nasa.gov/file/37856>)

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.3 Human Health and Performance
 - └ TX06.3.3 Behavioral Health and Performance

Target Destinations

The Moon, Mars

Human Spaceflight Capabilities

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Significant Media Coverage

(<https://techport.nasa.gov/file/37855>)

Project Website:

<https://taskbook.nasaprs.com>